

Amendment under 37 CFR §1.111
Application No. 10/594,921
Attorney Docket No. 071858

REMARKS

(1) Claims 1-9 and 12-19 are pending in this application, of which claims 1 has been amended. Claim 19 has been added.

(2) Claims 1, 2, 4-7, 9-15, and 17 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,968,705 to Yamada et al. in view of JP 11-269204.

(a) The temperature profile taught by Yamada et al does not meet the limitations of amended claim 1 as explained below:

Step 2 of claim 1 requires:

- i) the temperature of the aqueous liquid dispersion is raised up to a temperature 5°C lower than a target polymerization temperature at a heating rate of 25 to 50°C/hr,
- ii) the temperature of the aqueous liquid dispersion is raised up to the target polymerization temperature from the temperature 5°C lower than the target polymerization temperature at a heating rate of 10 to 20°C/hr, and
- iii) after the temperature of the aqueous liquid dispersion reaches the target polymerization temperature, a polymerization reaction is carried out while controlling the temperature of the aqueous liquid dispersion so as to fall within a range of (the target polymerization temperature \pm 3°C).

On the contrary, claim 1 of Yamada et al teaches:

A process for producing a polymerized toner comprising the steps of:
raising the temperature of an aqueous dispersion of monomer composition, in which the monomer composition comprises a colorant, a polymerization initiator and a polymerizable monomer component, to a temperature lower than a target polymerization temperature by about 10 to about 40 °C, then

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raising the temperature of the aqueous dispersion of monomer composition at the rate of about 1 °C to about 20 °C an hour to a temperature lower than the target polymerization temperature by about 5 °C, and then

raising the temperature of the aqueous dispersion of monomer composition at the rate of about 3 °C to about 10 °C an hour to the target polymerization temperature,

whereby the polymerizable monomer component is polymerized (claim 1 of Yamada et al).

First, the invention of claim 1 requires a heating rate of “25 to 50°C/hr” up to a temperature 5°C lower than a target polymerization temperature, whereas in such a temperature range Yamada’s process includes a heating at a rate of about 1 to 20°C/hr.

Second, the invention of claim 1 requires a heating rate of “10 to 20°C/hr” from the temperature 5°C lower than the target polymerization temperature up to the target polymerization temperature, whereas in such a temperature range Yamada’s process requires a rate of about 3 to 10 °C an hour.

Yamada’s process does not meet the claimed temperature profile.

(b) The difference of the temperature profile explained above is explained in more detailed. According to the production process of claim 1, the amount of scale adhered to an inner wall of a polymerization container is markedly reduced, and the polymerization time can be shortened even when the heating rate of an aqueous liquid dispersion containing a polymerizable

monomer composition is accelerated. In addition, a polymerized toner narrow in scattering of toner properties every production lot can be stably produced. Further, in the production process of the present invention, the corrosion-resistant metal container is used as the polymerization container, so that the lowering of the thermal conductivity of its inner wall due to a lining treatment can be avoided.

As evidenced by Example 1 of Table 1 of the original specification of the present application, the polymerization time is short, and the amount of scale produced is small even after the 5-batch continuous polymerization. In addition, a high-quality polymerized toner stable in fixing ability, storability, printing density and MI value was obtained.

On the other hand, as evidenced by Table 1 of the original specification of the present application, when the surface roughness R_y of the inner wall of the polymerization container is outside the claimed range (Comparative Example 1), the polymerization time is longer, and the amount of scale produced becomes great after the 5-batch continuous polymerization. In addition, scattering of fixing ability, storability, printing density, MI value, etc. becomes wide, and the quality of the polymerized toner is deteriorated.

When the heating rate is increased (Comparative Example 2), the amount of scale produced becomes great, and the polymerization time markedly lengthens after the 5-batch

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continuous polymerization. In addition, scattering of fixing ability, storability, printing density, MI value, etc. becomes wide, and the quality of the polymerized toner is deteriorated.

Yamada et al. teach that the temperature of the aqueous dispersion of monomer composition is raised by controlling the heating rate dividing a temperature range into the following three temperature ranges:

- (i) “Temperature Range I” that is up to a temperature lower than the target polymerization temperature by 10 to 40°C;
- (ii) “Temperature Range II” that is from the temperature lower than the target polymerization temperature by 10 to 40°C to a temperature lower than the target polymerization temperature by 5°C; and
- (iii) “Temperature Range III” that is from the temperature lower than the target polymerization temperature by 5°C to the target polymerization temperature.

Yamada et al specifically discloses: “The obtained aqueous dispersion of monomer composition was charged in a polymerization reactor with agitator. The obtained aqueous dispersion of monomer composition was raised from room-temperature to 80 degrees centigrade at an average rate of 50°C/hr, from 80 to 85°C at an average rate of 10°C/hr, from 85 to 89°C at an average rate of 7°C/hr, and was held at the target polymerization temperature of 90°C. This

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temperature profile is shown in FIG. 1, in which a dotted line is the profile of measured temperature, a solid line is the target profile, and "1" in a horizontal axis means the point at more than 80 degrees centigrade." Col. 28, lines 46-57.

In other words, in Yamada et al, the temperature of the aqueous dispersion of monomer composition is raised from room temperature to 80°C at a heating rate as relatively high as an average rate of 50°C/hr in Temperature Range I, then raised from 80 to 85°C at a heating rate as low as an average rate of 10°C/hr in the Temperature Range II, and further raised from 85°C to 90°C of the target polymerization temperature at a heating rate as low as an average rate of 7°C/hr. in the Temperature Range III.

In short, the production process taught by Yamada et al. requires markedly slow heating rate in the Temperature Ranges II and III. Therefore, Yamada's process requires extended time to reach the target polymerization temperature. In Example 1 of Yamada et al, it took 2.4 hours in total to raise the temperature of the aqueous dispersion of monomer composition from room temperature (for example, 20°C) to the target polymerization temperature (90°C). Here, the total heating time was calculated by: $(80 - 20)/50 + (85 - 80)/10 + (90 - 85)/7 = 2.4$ hours.

On the other hand, in the production process of the claimed invention, the temperature of the aqueous liquid dispersion can be raised from room temperature to a temperature lower than

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the target polymerization temperature by 5°C at a heating rate in a range of 25 to 50°C/hr. In this respect, Yamada et al. teach a rate of 1 to 20°C/hr in the temperature range II.

In addition, in the production process of the claimed invention, the temperature of the aqueous liquid dispersion can be raised from the temperature lower than the target polymerization temperature by 5°C to the target polymerization temperature at a heating rate as relatively high as 10 to 20°C/hr. Yamada et al disclose that the heating rate in the temperature range III is controlled to 3 to 10°C/hr. The heating rate specifically adopted in Example was 7°C/hr (col. 28, lines 46-57).

On the contrary, as to Example 1 described in the present specification, the specification describes that: "This aqueous liquid dispersion was heated to raise the temperature of the aqueous liquid dispersion from room temperature to 85°C at a heating rate of 40°C/hr on the average, and raise it from 85°C to 90°C at a heating rate of 15°C/hr on the average and finally raise the temperature of the aqueous liquid dispersion to a target polymerization temperature, 90°C." (Page 50, lines 5 to 11)

In Example 1 of the present specification, it took only 2.0 hours in total to raise the temperature of the aqueous dispersion of monomer composition from room temperature (20°C) to the target polymerization temperature (90°C.). The total heating time is calculated as (85 -

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$20/40 + (90 - 85)/15 = 2.0$ hours. The total heating time is shorter by 0.4 hours than the total heating time, 2.4 hours, in Example 1 of Yamada et al.

In Example 1 of the present specification, a heating rate as high as 15°C/hr was adopted in the final heating step. On the other hand, Comparative Example 1 of Yamada et al shows that when the temperature of the aqueous dispersion was raised at a rate of 15°C/hr in a range (Temperature Range III) of from 85°C to 90°C of the target polymerization temperature, it took 1.5 hours from the arrival at the target polymerization temperature of 90°C to stabilize the target polymerization temperature.

In other words, with respect to the heating rates in the temperature ranges II and III, Yamada et al teach wide temperature ranges of 1 to 20°C/hr and 3 to 10°C, respectively. However, Yamada et al actually adopt heating rates of 10°C/hr and 7°C/hr, respectively, thereby stabilizing temperature control after reached the target polymerization temperature.

Accordingly, the production process of the present invention and the production process of Yamada et al are markedly different in profile of heating rate of the aqueous dispersion.

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(c) Yamada et al do not disclose or suggest that a corrosion-resistant metal container, the surface roughness R_y of an inner wall of which is at most 3 μm , is used as the polymerization container as recited in claimed invention.

According to the production process of the claimed invention, the corrosion-resistant metal container is used as the polymerization container, so that the amount of scale adhered to an inner wall of a polymerization container is markedly reduced, and the polymerization time can be shortened even when the heating rate of an aqueous liquid dispersion containing a polymerizable monomer composition is accelerated.

JP 11-269204 discloses a method to prevent adhesion to a polymerization vessel used in emulsion polymerization of a copolymer latex, wherein the surface roughness of an inner wall in the polymerization vessel is $(R_a) \geq 0.3 \mu\text{m}$ in terms of center line average height, and the inner wall surface is coated with a silane-containing polymer (claim 1).

First, JP 11-269204 is directed to a polymerization vessel used in emulsion polymerization of the copolymer latex, which is different from a polymerization vessel used in suspension polymerization used in the process required in the claimed invention.

Second, Examples of JP 11-269204 show that even when an inner wall of a polymerization vessel is buff-polished so as to give a small surface roughness Ra of 0.3 μm , deposits adhere to the whole surface thereof without a silane-containing polymer coated on the inner wall thereof. Tables 1 and 2 of JP 11-269204 show that where an inner wall of a polymerization vessel is not coated with a silane-containing polymer, deposits adhere to the whole surface of the inner wall (evaluation of adhered condition: x). Examples of JP 11-269204 show that even when the surface roughness Ra of an inner wall of a polymerization vessel is within a range of 0.30 to 4.56 μm , deposits adhere if the inner wall is not coated with the silane-containing polymer.

In contrast, in the production process of the present invention, a corrosion-resistant metal container, the surface roughness Ry of an inner wall of which is at most 3 μm , is used as a polymerization container in a production process of a polymerized toner by a suspension polymerization process. The amount of scale adhered to the inner wall can be markedly reduced, and the lowering of the thermal conductivity of the inner wall can be prevented by reducing the amount of scale adhered. The temperature of an aqueous liquid dispersion can be stably controlled even when the heating rate of the aqueous liquid dispersion is accelerated, so that the polymerization time can also be shortened. The inner wall of the polymerization container used in the present invention does not need to be coated with a silane-containing polymer. The silane-containing polymer may adversely affect properties of the resulting polymerized toner.

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Accordingly, one of ordinary skill in the art cannot modify the teaching by Yamada in view of JP 11-269204.

(d) As to newly added claim 19, Applicants additionally argue in addition to the arguments explained in Section (c).

Newly added claim 19 recites “the surface roughness R_y of a *surface* of the inner wall of the corrosion-resistant metal container is at most 3 μm .” Claim 19 excludes a coating of the silane-containing polymer as taught by JP 11-269204. In JP 11-269204, a coating of the silane-containing polymer is located on the surface of the container, where the container is coated with a silane-containing polymer.

Tables 1 and 2 of JP 11-269204 show that unless an inner wall of a polymerization vessel is coated with a silane-containing polymer, deposits adhere to the surface of the inner wall, and that adhesion of deposits was prevented by coating the inner wall with the silane-containing polymer, as explained above. JP 11-269204 teaches coating the surface with a silane-containing polymer. JP 11-269204 clearly teaches away from non-coating with the silane-containing polymer. *See* Tables 1 and 2 of JP 11-269204. Since claim 19 is taught away from JP 11-269204, claim 19 should be allowed independently.

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(e) In order for a combination of references to render an invention obvious, the combination of the teachings of all or any of the references must suggest, expressly or by implication, the possibility of achieving further improvement by combining such teachings along the lines of the invention. Applicants find no suggestion, express or implied, in the combination of these references relating to the possibility of achieving further improvement, particularly in reducing the amount of scale adhered to the inner wall of a polymerization container, and accelerating of the heating rate of an aqueous liquid dispersion containing a polymerizable monomer composition by combining such teachings along the lines of the present invention. Thus, the cited combination of references does not render the present invention obvious.

It is therefore submitted that the presently claimed invention recited by claims 1 to 9 and 12 to 19 are not obvious over cited references. Reconsideration is respectfully requested.

(3) Claim 3 was rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5,968,705 to Yamada et al. in view of JP 11-269204, and further in view of JP 2003-287928.

In addition to the arguments supra, Applicants rebut the rejection as follows: JP 2003-287928 merely discloses that in a production process of a polymerized toner, which comprises the steps of dispersing a polymerizable monomer composition containing at least a polymerizable

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monomer and a colorant as droplets in an aqueous dispersion medium containing a dispersion stabilizer and then polymerizing the composition with a polymerization initiator to form colored polymer particles, which comprises a series of steps composed of (1) Step 1 of forming droplets of the polymerizable monomer composition containing at least the polymerizable monomer and the colorant in a first aqueous dispersion medium (A) containing the dispersion stabilizer to prepare a first aqueous liquid dispersion (B), in which the droplets are dispersed, (2) Step 2 of mixing the first aqueous liquid dispersion (B) with a second aqueous dispersion medium (C) containing 0.1 to 5% by weight of the dispersion stabilizer to prepare a second aqueous liquid dispersion (D) containing the second aqueous dispersion medium (C) in a proportion of 10 to 150 parts by weight per 100 parts by weight of the polymerizable monomer in the first aqueous liquid dispersion (B), and (3) Step 3 of polymerizing the polymerizable monomer composition dispersed as the droplets in the second aqueous liquid dispersion (D) with the polymerization initiator in a polymerization kettle to form the colored polymer particles.

The process of JP 2003-287928 is not effective for accelerating the heating rate. JP 2003-287928 can not remedy the deficiencies of Yamada et al and JP 11-269204.

It is therefore submitted that the presently claimed invention recited by claim 3 is not obvious over the references. Reconsideration is respectfully requested.

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(4) Claim 8 was rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5,968,705 to Yamada et al. in view of JP 11-269204, and further in view of JP 2003-277405.

In addition to the arguments supra, Applicants rebut the rejection as follows: JP 2003-277405 discloses “A method of preventing a polymer from adhering to a polymerization vessel used in emulsion polymerization, which comprises buff-polishing or electropolishing an inner wall of the polymerization vessel to control R_{max} in the inner wall to 0.5 to 1.2 μm .” (Claim 1)

However, JP 2003-277405 is directed to a polymerization vessel used in emulsion polymerization of a copolymer latex, and is not directed to a polymerization vessel used in suspension polymerization. JP 2003-277405 does not disclose that the polymerization vessel thereof is used in suspension polymerization, and quite naturally does not suggest that the vessel is used in a polymerization process of a polymerized toner by a suspension polymerization process.

In contrast, according to the production process of the claimed invention, the amount of scale adhered to an inner wall of a polymerization container is markedly reduced, and the polymerization time can be greatly shortened even when the heating rate of an aqueous liquid dispersion containing a polymerizable monomer composition is accelerated.

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In addition, according to the production process of the claimed invention, a polymerized toner narrow in scattering of toner properties every production lot can be stably produced even when the heating rate of an aqueous liquid dispersion containing droplets of the polymerizable monomer composition is accelerated.

JP 2003-277405 neither discloses nor suggests the features of claim 8. It is therefore submitted that claim 8 is not obvious over the cited references. Reconsideration is respectfully requested.

(5) Claims 16 and 18 were rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5,968,705 to Yamada et al. in view of JP 11-269204, and further in view of US Patent No. 5,958,640 to Hasegawa et al.


In addition to the arguments supra, Applicants rebut the rejection as follows: Hasegawa et al only disclose a polymerized toner of core-shell structure and the production process thereof. Hasegawa et al neither teach nor suggest a production process of a polymerized toner as presently claimed. Hasegawa et al can not remedy the deficiencies of Yamada et al and JP 11-269204.

It is therefore submitted that claims 16 and 18 are not obvious over the cited references. Reconsideration is respectfully requested.

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(6) In view of above, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date. If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned representative at the telephone number indicated below to arrange for an interview to expedite the disposition of this case. If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP


Shuji Yoshizaki
Patent Agent
Registration No. 62,785
Telephone: (202) 822-1100
Facsimile: (202) 822-1111

SY/mt